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**522 CMR 1.00 - 14.00**

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**BOARD OF BOILER RULES**

3. This document is reprinted from the Code of Massachusetts Regulations and contains the following:

- 522 CMR**
- 1.00 Reserved**
  - 2.00 Power Boilers**
  - 3.00 Power Boilers, Power Reactor Vessels & Piping & Unfired Pressure Vessels as used in Atomic Energy Installations.**
  - 4.00 Steam & Hot Water Boilers & Heat Storage Sources.**
  - 5.00 Heating Boilers**
  - 6.00 Low-Pressure Heating Boilers**
  - 7.00 Air Tanks**
  - 8.00 Existing Air Tanks**
  - 9.00 Refrigeration & Air Conditioning Systems**
  - 10.00 Material Specifications**
  - 11.00 Welding Specifications**
  - 12.00 Fiberglass Reinforced Plastic Pressure Vessels**
  - 13.00 Inservice Inspection of Nuclear Power Plant Components - Division 1**
  - 14.00 Reserved**

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A true copy attest:

*William Francis Galvin*

**WILLIAM FRANCIS GALVIN**  
Secretary of the Commonwealth



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(522 CMR 1.00: RESERVED)

NON-TEXT PAGE

## 522 CMR 2.00: POWER BOILERS

## Section

- 2.01: Scope and Application
- 2.02: Records
- 2.03: Miscellaneous Provisions

2.01: Scope and Application

In accordance with the provisions of M.G.L. c. 146, § 2, the Board of Boiler Rules herewith adopts by reference the 1998 A.S.M.E. Boiler and Pressure Vessel Code Section I, *Power Boilers* with 1999 addenda, with the exception of the method used to determine the safety valve relieving capacity.

This A.S.M.E. code is on file with the State Secretary, but is not published with the Code of Massachusetts Regulations by reason of it's being reasonably accessible to that portion of the public affected by it.

2.02: Records

To insure the proper daily inspection of steam boilers, the following shall apply:

(1) All Engineer's and Firemen in charge of steam boiler(s) and/or engines shall notify the Department in writing the location of the boilers and/or engines in which they are in charge of. When accepting or leaving a position as an engineer or fireman in charge, the engineer or fireman have seven calendar days to notify the department.

(2) When an engineer or fireman states that he is "in charge" of steam boilers or steam engines, it is understood that he/she is in actual authority as the "engineer in charge," and is held responsible by the owners as well as by the proper authorities for the daily operation and maintenance of the steam boilers or engines specified; also that all persons operating these boilers or engines do so under the direct authority of the "engineer in charge". In order to effectively perform his/her duties, the engineer-in-charge must make daily visits to the plant. It is expected that people performing the duties as the engineer in charge will leave daily instructions to the operating personnel, and that those instructions shall be made available to the inspectors of the department upon request. The engineer-in-charge shall sign the Engineer's Record Book, as provided for in M.G.L. c. 146, § 51, on a daily basis. It is reasonable for the engineer-in-charge to perform his duties at the facility five days and to give written instructions to the personnel during the designated weekends.

(3) When an engineer or fireman state that he/she is "operating" steam boilers or steam engines, it is understood that during that time stated they are actually engaged as an assistant to the person "in charge", and during his/her hours on duty, is held responsible by the person in charge as well as by the proper authorities for the proper operation of the boilers and engines specified, and their appurtenances. Operators of steam boilers shall complete and sign the Operator's Record Book, as provided for in M.G.L. c. 146, § 46A, on a daily basis. These records shall be made available to the Inspectors of the Department of Public Safety upon request.

(4) In the event an accident or incident in which a steam boiler or its appurtenances are involved, the Department of Public Safety must be notified within 24 hours of the accident/incident. In the event of a fatality, the scene of the accident must not be disturbed except for the removal of the dead or injured persons until approval is granted by an inspector of the Division. Only accidents of incidents that require hospitalization or resulting in damage exceeding \$10,000 per incident, must be reported. Such accidents and incidents shall be reported to the Department at 1-800-223-0933, during normal working hours, or to the State Police at 1-617-727-2919 during off hours or weekends.

2.03: Miscellaneous Provisions

(1) Safety valves as defined in the ASME code section I, shall be the only device accepted to limit the pressure carried by a boiler. Other devices may be used in supplement to this device, to control operating pressure but shall not be used as the recognized device limiting the pressure.

## 2.03: continued

(2) Safety Valve Relieving Capacity. The minimum safety valve relieving capacity for other than electric boilers, waste heat boilers, and forced flow steam generators with no fixed steam and waterline, shall be determined on the basis of pounds of steam generated per hour per square foot of boiler heating surface and waterwall heating surface as given in 522 CMR 2.03(2): *Table 1*.

In many cases, a greater safety valve relieving capacity will have to be provided than that estimated in 522 CMR 2.03(2): *Table 1*, in order to meet the requirements of ASME Section I, PG-67.2.

TABLE 1  
MINIMUM POUNDS OF STEAM PER HOUR  
PER SQUARE FOOT OF HEATING SURFACE

	Firetube Boilers	Watertube Boilers
<i>Boiler Heating Surface</i>		
Hand fired	5	6
Stoker fired	7	8
Oil, gas, or pulverized fuel fired	8	10
Single pass fire tube	12	
<i>Waterwall Heating Surface</i>		
Hand fired	8	8
Stoker fired	10	12
Oil, gas or pulverized fuel fired	14	16

The safety valve capacity for each boiler, except as that noted above, shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6% above the highest pressure at which any valve is set and in no case to more than 6% above the maximum allowable working pressure. The safety valve capacity shall be in compliance with 522 CMR 2.03(2): *Table 1*.

(3) Maximum Designed Steaming Capacity. The maximum designed steaming capacity shall be no less than the following:

(a) By measuring the maximum amount of fuel that can be burned. The weight of steam generated per hour is found by the formula:

$$W = \frac{C \times H \times .75}{1100}$$

where

W = weight of steam generated / hour, lb

C = total weight or volume of fuel burned / hour at time of maximum forcing, lb or cu. Ft.

H = heat of combustion of fuel, Btu/lb or Btu / cubic foot (See 522 CMR 2.03(3): *Table 2*)

The sum of the safety valve capacities marked on the valves shall be equal to or greater than W.

(b) By determining the pounds of steam generated per hour per square foot of heating surface, as given in 522 CMR 2.03(2): *Table 1*. In many cases, a greater safety valve relieving capacity will have to be provided than that estimated in 522 CMR 2.03(2): *Table 1*, in order to meet the requirements of ASME Section I, PG-67.2.



2.03: continued

Table 2  
BTU VALUES FOR FUELS

Fuels	H = Btu/lb
Semibituminous coal	14,500
Anthracite	13,700
Screenings	12,500
Coke	13,500
Wood, hard or soft, kiln dried	7,700
Wood, hard or soft, air dried	6,200
Wood shavings	6,400
Peat, air dried, 25% moisture	7,500
Lignite	10,000
Kerosene	20,000
Petroleum, crude oil, Pennsylvania	20,700
Petroleum, crude oil, Texas	18,500
MSW / RDF (prepared trash)	4,500

	H = Btu/cu ft
Natural gas	960
Blast furnace gas	100
Producer gas	150
Water gas, uncarbureted	290

(4) Water Columns. For boilers not exceeding 200 p.s.i., with single guage glass connections, all water columns shall be constructed with a minimum of three try-cocks to provide a safe means for determining the boiler water level if the guage glass is removed from service.

(5) Pressure Tests.

- (a) When there is doubt as to the extent of a defect of detrimental condition found in a pressure vessel, the Inspector may require a pressure test. A pressure test normally need not be made as part of a periodic inspection. However, a test shall be made when unusual, hard to evaluate forms of deterioration possibly affecting the safety of a vessel are disclosed by inspection and also after certain repairs.
- (b) To determine tightness, the test pressure need be no greater than the set pressure of the safety valve having the lowest setting.
- (c) The pressure test shall not exceed  $1\frac{1}{2}$  times the maximum allowable working pressure.
- (d) During a pressure test, where the test pressure will exceed the set pressure of the safety valve having the lowest setting, the safety relief valve or valves shall be removed or each valve disk be held down by means of a test clamp and not by applying additional load to the valve spring by turning the compression screw.
- (e) The minimum temperature of the water used to apply a hydrostatic test shall not be less than 70°F unless the owner provides information on the brittle characteristics of the vessel material to indicate the acceptability of a lower test temperature. The maximum temperature is not to be more than 120°F unless the owner specifies a temperature higher than 120°F, the pressure shall be reduced to the MAWP and the temperature to 120°F for close inspection.
- (f) When the contents of the vessel prohibit contamination by any other medium or when a hydrostatic test is not possible, other testing media may be used providing the precautionary requirements are adhered to. In such cases, there shall be agreement as to the testing procedure between the owner and the Inspector.

(6) Heat Recovery Steam Generators (HRSG's). All heat recovery steam generators built after May 1, 2000 shall be built to the code as indicated in 522 CMR 2.01.

2.03: continued

(7) Restrictions, Dual Pressure Controls, Bypass Switches.

(a) Steam boilers under this section are prohibited from having any device that enables the boiler to operate at a pressure less than 10% of its normal operating pressure. Dual pressure controls or any similar device are prohibited from use on all steam boilers operating above 15 PSIG.

(b) Manual devices and switches that allow the bypass of any safety control, are prohibited unless such device or switch is provided with a "dead-man" capability that ensures that the operator is present and responsible when the device or switch is in use. No such device or switch shall have the capability to fail in the closed position.

REGULATORY AUTHORITY

522 CMR 2.00: M.G.L. c. 30, § 37; c. 146, § 2.

522 CMR 3.00: POWER BOILERS, POWER REACTOR VESSELS AND PIPING AND UNFIRED PRESSURE VESSELS AS USED IN ATOMIC ENERGY INSTALLATIONS

Section

- 3.01: Scope and Application
- 3.02: Inspector and Records
- 3.03: Miscellaneous Provisions

3.01: Scope and Application

(1) In accordance with the provisions of M.G.L. c. 146, § 2, the Board of Boiler Rules herewith adopts by reference RULES FOR CONSTRUCTION OF NUCLEAR VESSELS, 1998 Edition, with 1999 addenda, formulated and published by the American Society of Mechanical Engineers, as A.S.M.E. NUCLEAR VESSELS, SECTION III, RULES FOR CONSTRUCTION OF NUCLEAR VESSELS.

(2) 522 CMR 3.00 shall be applicable to the construction, installation and inspection of steam boilers, power reactor vessels, containment vessels, piping, reactor plant appurtenances and unfired pressure vessels as used in atomic energy installations subject to the provisions of M.G.L. c. 146.

3.02: Inspector and Records

(1) An appropriate national board commissioned inspector shall be on the site during the mechanical construction and testing phases of every nuclear reactor installation, its components, appurtenances, containment vessel and piping systems.

(2) Permanent records shall be kept to maintain complete traceability of all material used in the construction of any nuclear reactor plant. These records shall include certificates of chemical and physical properties.

(a) Permanent records shall be kept at the plant site to maintain complete traceability of all welds that fall within the limits of Section III of the current edition of the A.S.M.E. Code that has been accepted and approved by the Board of Boiler Rules and the Commonwealth of Massachusetts.

(b) Permanent records shall be maintained identifying all welders, and their qualifications, performing welds covered in 522 CMR 3.02(2)(a).

3.03: Miscellaneous Provisions

(1) The owner of a nuclear power plant shall provide a procedure by which all agency reports and data sheets shall be coordinated to the satisfaction of the Department of Public Safety of the Commonwealth of Massachusetts.

(2) The Engineering Section of the Department of Public Safety may, from time to time, make such inspection as it deems appropriate.

(3) Pressure Tests.

(a) When there is doubt as to the extent of a defect of detrimental condition found in a pressure vessel, the Inspector may require a pressure test. A pressure test normally need not be made as part of a periodic inspection. However, a test shall be made when unusual, hard to evaluate forms of deterioration possibly affecting the safety of a vessel are disclosed by inspection and also after certain repairs.

(b) To determine tightness, the test pressure need be no greater than the set pressure of the safety valve having the lowest setting.

(c) The pressure test shall not exceed 1½ times the maximum allowable working pressure.

(d) During a pressure test, where the test pressure will exceed the set pressure of the safety valve having the lowest setting, the safety relief valve or valves shall be removed or each valve disk be held down by means of a test clamp and not by applying additional load to the valve spring by turning the compression screw.

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### 3.03: continued

(e) The minimum temperature of the water used to apply a hydrostatic test shall not be less than 70°F unless the owner provides information on the brittle characteristics of the vessel material to indicate the acceptability of a lower test temperature. The maximum temperature is not to be more than 120°F unless the owner specifies a temperature higher than 120°F, the pressure shall be reduced to the MAWP and the temperature to 120°F for close inspection.

(f) When the contents of the vessel prohibit contamination by any other medium or when a hydrostatic test is not possible, other testing media may be used providing the precautionary requirements are adhered to. In such cases, there shall be agreement as to the testing procedure between the owner and the Inspector.

### REGULATORY AUTHORITY

522 CMR 3.00: M.G.L. c. 146, §§ 46 through 51; c. 30, § 37; c. 22, § 10A.

## 522 CMR 4.00 STEAM AND HOT WATER BOILERS AND HEAT STORAGE SOURCES

## Section

- 4.01: Scope and Effectiveness
- 4.02: Definitions
- 4.03: General Requirements
- 4.04: Existing Installations

4.01: Scope and Effectiveness

(1) 522 CMR 4.00 shall apply to boilers used for steam generation, hot water heating boilers, hot water supply boilers or for heating liquids used as a heat storage source as follows:

- (a) Steam Power Boilers. Over 3 H.P. constructed for pressures in excess of 15 p.s.i.
- (b) Hot Water Heating Boilers. Exceeding 30 p.s.i.g. operating pressure; or 250°F operating temperature.
- (c) Hot Water Supply Boilers and Other Liquid Heat Storage Sources When Any of the Following Are Exceeded.
  - 1. 160 pounds p.s.i.
  - 2. 250°F operating temperature.

(2) In accordance with the provisions of M.G.L. c. 146, § 2, the Board of Boiler Rules herewith adopts by reference the 1998 A.S.M.E. Boiler and Pressure Vessel Code Section I, Power Boilers and Section IV, Heating Boilers, with 1999 addenda, together with 522 CMR 4.00 shall be the rules for construction and installation of boilers coming within the scope of 522 CMR 4.01(1)(a), 4.01(1)(b), and 4.01(1)(c) and the construction and installation of such boilers shall conform thereto. All applicable sections of the A.S.M.E. Code are filed with the Secretary of the Commonwealth.

All boilers within the scope of 522 CMR 4.01(1)(a), 4.01(1)(b), and 4.01(1)(c) except Cast Iron, Mass. Std., and Mass. Heat Boilers shall be stamped N.B. and data reports shall be registered with the National Board.

Boilers within the scope of 522 CMR 4.01(1)(a), 4.01(1)(b), and 4.01(1)(c) which were operated in the Commonwealth prior to the publication of 522 CMR 4.00 with the Secretary of the Commonwealth and which conform to the Existing Installation Rules hereafter established may be continued in such service.

The rules for the installation and appurtenances shall apply to a relocated boiler to the extent permitted by the design and construction of the boiler. All rules and parts of rules inconsistent herewith are hereby repealed.

4.02: DefinitionsAuthorized Inspector.

- (a) A district engineering inspector employed by the Division of Inspection, Department of Public Safety, Commonwealth of Massachusetts, or
- (b) A boiler inspector holding a Certificate of Competency as a boiler inspector, issued him by the Division of Inspection to field inspect boilers within the Commonwealth or make shop inspections in the shop of an authorized manufacturer while employed by an authorized insurance company, or
- (c) A boiler inspector employed by a authorized insurance company who holds a current commission issued him by the National Board, or such other inspectors holding National Board Commissions as are approved by the Chief of Inspections.

**NOTE:** Field inspections of boilers in Massachusetts may be made only by district engineering inspectors in the employ of, or holders of Certificates of Competency issued by the Department of Public Safety of the Commonwealth of Massachusetts.

Authorized Manufacturer. A boiler manufacturer who has registered with the Board of Boiler Rules and has been authorized by the Board to build steel plate boilers for use in Massachusetts. The boiler manufacturer shall hold the appropriate ASME Code stamp or Massachusetts Standard and shall hold a valid certificate of authorization.

Massachusetts Heat Boiler. A steel plate boiler built by an authorized manufacturer in accordance with Section IV of the A.S.M.E. Code but not stamped with the Code symbol.

4.02: continued

National Board. The National Board of Boiler and Pressure Vessel Inspectors with headquarters in Columbus, Ohio.

4.03: General Requirements

(1) All boilers not complying with 522 CMR 4.03(2) shall be built by an ASME authorized manufacturer.

(2) Massachusetts Standard and Massachusetts Heat Boilers. Inspection and Stamping. Mass. Std. and Mass. Heat Boilers shall be inspected during construction by an authorized inspector.

Each such boiler shall be stamped MASS. STD. or MASS. HEAT with a MASS. STD. or MASS. HEAT number unless the boiler is a miniature boiler as defined in Section I of the A.S.M.E. Code. When a boiler is a miniature boiler so defined, it shall be stamped MASS. MIN. with a MASS. MIN. number. The stamping of MASS. STD., MASS. HEAT or MASS. MIN. boilers shall also include the following data:

- (a) Manufacturer's name;
- (b) Year built;
- (c) Maximum Allowable Working Pressure;
- (d) Safety valve relieving capacity (minimum) pounds per hour.

A manufacturer's data report shall be filed with the Chief of Inspections, Department of Public Safety, on forms furnished by the Department.

(2) Frequency of Inspection. Boilers within the scope of 522 CMR 4.00 shall be inspected as follows:

- (a) Steam Power Boilers. One annual external inspection and one annual internal inspection. The annual external inspection should be made at or about six months after the annual internal inspection except in the case of a boiler that is in service a portion of the year only, in which case the annual external shall be made during such period of service.
- (b) Hot Water Boilers (Heating, Supply, and Heat Storage Source). Annual external with an internal once each three years where construction permits. The year the internal inspection is made the external inspection may be made at the same time.
- (c) Nuclear Vessels and Piping. Section XI, A.S.M.E. Code, shall be used as the guide for determining inspection frequency.

(3) Inspection Reports. Inspection reports shall be submitted on forms approved by the Division of Inspection of the Department of Public Safety.

(4) Preparation for Inspection. The owner or user of a boiler which requires internal inspection by the Division of Inspection of the Department of Public Safety, or by an insurance company, as provided by M.G.L. c. 146, shall prepare the boiler for inspection by cooling (blanking off connections to adjacent boilers, if necessary), removing all soot and ashes from tubes, heads, shell, furnace and combustion chamber; drawing off the water; removing the handhole and manhole plates; removing grate bars from internally fired boilers; and removing the steam gauge for testing.

If a boiler has not been properly cooled, or otherwise prepared for inspection, the boiler inspector shall decline to inspect it, and he shall not issue a certificate of inspection until satisfactory inspection has been made.

(5) Certificate of Inspection. The certificate of inspection, as required by M.G.L. c. 146, § 2 shall be that authorized by the Board.

The certificate of inspection shall be posted in a conspicuous place in the engine or boiler room in which the boiler specified is located; and it shall not be removed therefrom unless the boiler or its appendages become defective, or a new certificate is issued. If in the judgment of the inspector the boiler or its appendages are found to be in a defective or dangerous condition the certificate shall be removed by a district engineering inspector of the Division of Inspection of the Department of Public Safety, or an inspector holding a certificate as an inspector of steam boilers, as provided by M.G.L. c. 146.

## 4.03: continued

(6) Boilers Removed from the Commonwealth. A boiler which has been used in this Commonwealth and removed therefrom, which does not conform in every detail with the rules of construction formulated by this Board, and has been previously inspected by a district engineering inspector of the Division of Inspection of the Department of Public Safety, or by an inspector of an insurance company authorized to insure steam boilers in this Commonwealth, and has been stamped with a Mass. Serial Number, may be inspected and a certificate of inspection issued if relocated in this Commonwealth.

(7) Installation of Used Boilers in the Commonwealth. Whoever owns and operates a boiler not in the Commonwealth of Massachusetts which was not shop inspected and stamped in accordance with the code, but bears the stamping of another state or political subdivision which has adopted a standard of construction equivalent to that of Massachusetts, and wishes to operate said steam boiler within the Commonwealth of Massachusetts, may petition the Chief of Inspections of the Department of Public Safety for permission to do so. Such petition shall be accompanied by a copy of the original data report of the manufacturer of the boiler, signed by the inspector who made the original shop inspection, together with the field inspection data sheet and report covering the inspection of the boiler, made by a commissioned boiler inspector. Upon receiving this information and if the boiler is found to comply with the Massachusetts rules with regard to material, construction and workmanship, and found to be in safe working condition and equipped with all necessary appendages, the Chief of Inspections shall cause to be issued a certificate of inspection establishing the safe working pressure.

(8) Welded Repairs, Major Repairs and Alterations. No repairs or alterations shall be done by the welding process without the previous approval of an authorized inspector. If in the opinion of the inspector a hydrostatic test is necessary, such test shall be applied when the work is completed.

The welded repairs or alterations shall be completed in accordance with the National Board Inspection Code, RULES FOR REPAIR AND ALTERATIONS BY WELDING. In no case shall the repair be required to be made to a higher degree than that to which the boiler was originally constructed.

When repairs or alterations are performed by the welding process on Nuclear Vessels or Nuclear Piping the requirements of Section XI, A.S.M.E. Code, paragraphs IS300 and IS400 must be accomplished in addition to the above mentioned requirements.

(9) Stamping of Boilers. Each steel boiler within the scope of 522 CMR 4.00 shall be stamped with a serial number of the Commonwealth of Massachusetts, preceded by the letter "S" for steam boilers and "W" for hot water and other liquid heat storage sources, said letters and figures to be not less than 5/16" in height. The stamping shall not be concealed by lagging or paint and shall be exposed at all times, and shall be as close as practicable to the manufacturer's stamping. Each cast iron boiler and hot water supply boiler within the scope of 522 CMR 4.00 which cannot be stamped directly shall have securely attached to the front of the boiler a noncorrosive metal tag not less than one inch in height, which shall have the serial number stamped thereon. Said number shall remain on the boiler as an identification during the life of the boiler as a pressure vessel.

(10) Cracks in the Shell or Drum of a Boiler. The shell or drum of a boiler in which a crack is discovered shall be immediately discontinued from service. When cracks cannot be repaired, in the judgment of the authorized inspector, within the scope of the RULES FOR REPAIRS AND ALTERATIONS BY WELDING, a review board will be appointed by the Chief of Inspections to accept or to reject the procedure for repairs to the boiler.

4.04: Existing Installations

(1) Standard Boilers. The maximum allowable working pressure of standard boilers shall in no case exceed the pressure indicated by the manufacturer's identification stamped or cast on the boiler or on a plate secured to it.

4.04: continued

(2) Nonstandard Boilers, Riveted or Welded. The maximum allowable working pressure that will be allowed on nonstandard riveted or welded boilers covered by 522 CMR 4.00, shall be determined in accordance with paragraphs EPV2 & EPV3 of Chapter III, Section III, National Board Inspection Code.

(3) Nonstandard Cast Iron Boilers. The maximum allowable working pressure of a nonstandard boiler composed principally of cast iron shall not exceed 15 p.s.i.g. for steam service or 30 p.s.i.g. for hot water service or other liquid heat storage source.

The maximum allowable working pressure of a nonstandard boiler having a cast iron shell or heads and steel or wrought iron tubes shall not exceed 15 p.s.i.g. for steam service or 30 p.s.i.g. for hot water heating service nor for hot water supply or other liquid heat storage source.

(4) Safety Valves. Each steam boiler shall have an A.S.M.E. officially rated safety valve or valves as required by the applicable paragraphs of Section I or IV. Said valves must also bear the National Board approved stamp.

(5) Safety Relief Valves. Each hot water heating boiler, hot water supply boiler or other liquid heat storage source shall have an A.S.M.E. official rated Safety Relief Valve or Valves as required by the applicable paragraphs of Section I or IV of the A.S.M.E. Code. Said valves must also bear the National Board approval stamp.

(6) Steam Gages. Each steam boiler shall have steam pressure gage installed in accordance with the applicable paragraphs of Sections I or IV or the A.S.M.E. Code.

(7) Pressure Gages, Altitude Gages and Thermometers. Each hot water heating boiler, hot water supply boiler or other liquid heat storage source shall have a pressure gage and a thermometer installed on separate connections to the pressure vessel. Hot water supply boilers and other liquid heat storage sources which do not supply hot water or other heat energy at an altitude or more than 20 feet may omit the altitude gage.

(8) Water Gage Glasses. Each steam boiler shall have one or more water gage glasses installed in accordance with the applicable paragraphs of Section I or IV of the A.S.M.E. Code.

(9) Stop Valves and Check Valves. Stop valves and check valves shall be installed as required by the applicable paragraphs of Section I or IV of the A.S.M.E. Code.

(10) Feedwater Connections. Feedwater connections shall comply with the applicable paragraphs of Section I or IV of the A.S.M.E. Code.

(11) Water Equalizer. When two or more boilers are connected together there shall be no water equalizer or other connection below the normal water line through which it would be possible for water to flow from one boiler to the other.

(12) Cracks in the Shell or Drum of a Boiler. The shell or drum of a boiler in which a crack is discovered shall be immediately discontinued from service. When cracks cannot be repaired, in the judgment of the authorized inspector, within the scope the RULES FOR REPAIRS AND ALTERATIONS BY WELDING, a review board will be appointed by the Chief of Inspections to accept or to reject the procedure for repairs to the boiler.

(13) Pipe and Fittings. All pipe fittings and valves shall be a required by the applicable paragraphs of Section I or IV of the A.S.M.E. Code.

(14) Fusible Plugs. Fusible plugs are not recommended for boilers in the above classes. They should only be used where solid fuel is used on grates having a fuel bed. If fusible plugs are used they shall be placed at the lowest safe water line and in contact with the products of combustion. If they are used in cast iron boilers they shall be placed in an accessible point in the combustion chamber.



4.04: continued

(15) Repairs and Renewals of Fittings and Appliances. Whenever repairs are made to fittings or appliances, or it becomes necessary to replace them, the repairs must comply with the applicable paragraphs of Sections I or IV of the A.S.M.E. Code for new construction.

(16) Pressure Tests.

(a) When there is doubt as to the extent of a defect of detrimental condition found in a pressure vessel, the Inspector may require a pressure test. A pressure test normally need not be made as part of a periodic inspection. However, a test shall be made when unusual, hard to evaluate forms of deterioration possibly affecting the safety of a vessel are disclosed by inspection and also after certain repairs.

(b) To determine tightness, the test pressure need be no greater than the set pressure of the safety valve having the lowest setting.

(c) The pressure test shall not exceed  $1\frac{1}{2}$  times the maximum allowable working pressure.

(d) During a pressure test, where the test pressure will exceed the set pressure of the safety valve having the lowest setting, the safety relief valve or valves shall be removed or each valve disk be held down by means of a test clamp and not by applying additional load to the valve spring by turning the compression screw.

(e) The minimum temperature of the water used to apply a hydrostatic test shall not be less than 70°F unless the owner provides information on the brittle characteristics of the vessel material to indicate the acceptability of a lower test temperature. The maximum temperature is not to be more than 120°F unless the owner specifies a temperature higher than 120°F, the pressure shall be reduced to the MAWP and the temperature to 120°F for close inspection.

(f) When the contents of the vessel prohibit contamination by any other medium or when a hydrostatic test is not possible, other testing media may be used providing the precautionary requirements are adhered to. In such cases, there shall be agreement as to the testing procedure between the owner and the Inspector.

REGULATORY AUTHORITY

522 CMR 4.00: M.G.L. c. 146, § 2; c. 22, § 10A.

NON-TEXT PAGE

## 522 CMR 5.00: HEATING BOILERS

## Section

- 5.01: Scope and Application
- 5.02: Definitions
- 5.03: General Requirements
- 5.04: Steel Plate Boilers
- 5.05: Fusion Welded Boilers
- 5.06: Cast Iron Boilers
- 5.07: Installation, Fittings and Appliances

5.01: Scope and Application

(1) Requirements. 522 CMR 5.00 shall apply to boilers used for steam generation, hot water heating boilers, hot water supply boilers, or for heating liquids used as a heat storage source which exceed three horsepower, as follows:

(a) Steam Heating Boilers. Having a capacity of more than 207 pounds of steam per hour output and not in excess of 15 p.s.i.

(b) Hot Water heating Boilers.

1. Not exceeding 30 psig operating pressure; or 250°F operating temperature.
2. Having a capacity of more than 200,000 BTU output of the boiler nozzle.

(c) Hot Water Supply Boilers and Other Liquid Heat Storage Sources Not Exceeding:

1. 160 psig operating pressure,
2. 250°F operating temperature, except that 522 CMR 5.00 shall ~~not~~ apply to units in this category when ~~none of~~ the following limitations are exceeded:

Heat input of 200,000 BTU per hour,

A water temperature of 200°F,

A nominal water containing capacity of 120 gallons.

(d) Scope. 1998 Section IV of the A.S.M.E. Code, with 1999 addenda, together with the rules contained herein shall be the Rules for Construction and Installation of Low Pressure Heating Boilers, and the construction and installation of low pressure heating boilers shall conform thereto. (Said 1998 Section IV of the Code is filed with the Secretary of the Commonwealth herewith).

(e) Stamping. All Low Pressure Heating Boilers shall have the A.S.M.E. (H) stamp, stamped or cast into the metal of the boiler. All Low Pressure Heating Boilers, except cast iron and "Mass. Heat" boilers shall also be stamped National Board and data reports shall be registered with the National Board.

(f) Exceptions. Boilers operated at pressures not exceeding the above units which were in the Commonwealth prior to filing of 522 CMR 5.00 with the State Secretary and which conform to the Existing Installation Rules hereafter established may be continued in such service. The rule for installation and appurtenances shall apply to a relocated boiler to the extent permitted by the design and construction of the boiler. All rules and parts of rules inconsistent herewith are hereby repealed.

5.02: Definitions

(1) Authorized Manufacturer. A boiler manufacturer who has registered with the Board of Boiler Rules and has been authorized by the Board to build low pressure steel plate boilers for use in Massachusetts, or a boiler manufacturer who has a certificate of authorization to use the ASME Code "H" stamps.

(2) National Board. The National Board of Boiler and Pressure Vessel Inspectors with headquarters in Columbus, Ohio.

(3) Commissioned Pressure Vessel Inspector.

(a) A district engineering inspector employed by the Division of Inspection, Department of Public Safety, Commonwealth of Massachusetts, or

(b) A pressure vessel inspector holding a certificate of competency as a pressure vessel inspector issued him by the Division of Inspection to field inspect pressure vessel within the Commonwealth or make shop inspections in the shop of an authorized manufacturer while employed by the authorized insurance company named in the certificate, or

## 5.02: continued

(c) A pressure vessel inspector employed by an authorized insurance company who holds a current commission issued him by the National Board, or such other inspectors holding National Board Commission as are approved by the Chief of Inspections.

**NOTE:** Field inspections of boilers in Massachusetts may be made only by district engineering inspectors in the employ of, or holders of certificates of competency issued by the Department of Public Safety of the Commonwealth of Massachusetts.

(4) Massachusetts Heat Boiler. A steel plate boiler built by an authorized manufacturer in accordance with the requirements of Section IV of the A.S.M.E. Code but not stamped with the Code symbol.

5.03: General Requirements

(1) Massachusetts Heat Boilers, Inspection and Stamping. Mass. Heat Boilers shall be inspected during construction by an authorized pressure vessel inspector holding a current Massachusetts certificate of competency as a pressure vessel inspector or a district Engineering Inspector employed by the Department of Public Safety, Division of inspection.

Each boiler shall be stamped MASS. HEAT together with the Mass. Heat number and year built, and with the following data:

- (a) Manufacturer's name
- (b) Maximum allowable working pressure
- (c) Safety valve relieving capacity (minimum) in pounds per hour

A manufacturer's data report shall be filed with the Chief of Inspections, Department of Public Safety, on forms approved by the Chief of Inspections (M.G.L. c. 146, § 18).

(2) Frequency of Inspection. Low Pressure Heating Boilers shall be inspected as follows:

- (a) Steam Boilers. Annual external which shall include an internal inspection when construction permits.
- (b) Hot Water Boilers (Heating, Supply and Heat Storage Source). Annual external with an internal once each three years where construction permits. The year the internal inspection is made the external inspection may be made at the same time.

(3) Inspection Reports. Inspection reports shall be submitted on forms approved by the Division of Inspection of the Department of Public Safety.

(4) Preparation of Inspection. the owner or user of a boiler which requires internal inspection by the Division of inspection of the Department of Public Safety, or by an insurance company, as provided by M.G.L. c. 146, shall prepare the boiler for inspection by cooling (blanking off connections to adjacent boilers, if necessary), removing all soot and ashes from tubes, heads, shell, furnace and combustion chamber; drawing off the water; removing the handhole and manhole plates; removing grate bars from internally fired boilers; and removing the steam gage for testing.

If a boiler has not been properly cooled, or otherwise prepared for inspection, the boiler inspector shall decline to inspect it, and he shall not issue a certificate of inspection until a satisfactory inspection has been made.

(5) Certificate of Inspection. The certificate of inspection, as required by M.G.L. c. 146, § 2, shall be that authorized by the Board.

The certificate of inspection shall be posted in a conspicuous place in the engine or boiler room in which the boiler specified is located; and it shall not be removed therefrom unless the boiler or its appendages become defective, or a new certificate is issued. If in the judgment of the inspector the boiler or its appendages are found to be in a defective or dangerous condition the certificate shall be removed by a district engineering inspector or the Division of Inspection of the Department of Public Safety, or an inspector holding a certificate of competency as an inspector of pressure vessels, as provided by M.G.L. c. 146.

## 522 CMR: BOARD OF BOILER RULES

### 5.03: continued

(6) Boilers Removed from the Commonwealth. A boiler which has been used in this Commonwealth and removed therefrom, which does not conform in every detail with the rules of construction formulated by this Board, and has been previously inspected by a district engineering inspector of the Division of Inspection of the Department of Public Safety, or by and inspector of an insurance company authorized to insure steam boilers in this Commonwealth, and has been stamped with a Mass. Serial Number, may be inspected and a certificate of inspection issued if relocated in this Commonwealth.

(7) Installation of Used Boilers in the Commonwealth. whoever owns and operates a boiler not in the Commonwealth of Massachusetts which was not shop inspected and stamped in accordance with the Code, but bears the stamping of another state or political subdivision which has adopted a standard of construction equivalent to that of Massachusetts, and wishes to operate said steam boiler within the Commonwealth of Massachusetts, may petition the Chief of Inspections of the Department of Public Safety for permission to do so. Such petition shall be accompanied by a copy of the original data report of the manufacturer of the boiler, signed by the inspector who made the original shop inspection, together with the field inspection data sheet and report covering the inspection of the boiler, made by a commissioned boiler inspector. Upon receiving this information and if the boiler is found to comply with the Massachusetts rules with regard to material, construction and workmanship, and found to be in safe working condition and equipped with all necessary appendages, the Chief of Inspections shall cause to be issued a certificate of inspection establishing the safe working pressure.

### 5.04: Steel Plate Boilers

(1) Maximum Allowable Pressure. Whenever the term "maximum allowable pressure" is used, it refers to gauge pressure or the pressure above the atmospheric pressure in pounds per square inch.

(2) Authorization to Manufacturer. Unless a boiler manufacturer holds the appropriate ASME Code stamp, any manufacturer who desires to construct low pressure steel plate boilers, for use in Massachusetts, shall make written application to the Board of Boiler Rules for permission to construct such boilers and receive written authority from said board before taking any steps toward furnishing them for use in Massachusetts.

The manufacturer shall furnish the Board such information as may be required to determine that he has the equipment and is otherwise application and has made arrangements for shop inspections when required be 522 CMR 5.00.

### 5.05: Fusion Welded Boilers

(1) Fusion Welding. The fusion welding process consists of manual or of machine welding using either the arc or gas welding process.

(2) Steel Plate Boilers. Steel plate boilers, constructed by fusion welding under the rules prescribed for steel plate heating boilers may be used for steam heating at pressures not exceeding 15 p.s.i. assuming the strength of the welded joint at 28,000 p.s.i. of net section of plate. In determining the pitch of staybolts, fusion welded joints may be considered as fully supported except where the joint occurs in a flat surface.

(3) Design and Construction. The design, construction, and stamping fusion welded boilers shall in all cases conform to the formulas, specifications, and data which are given in the rules prescribed for steel plate heating boilers, unless some special requirement is necessary because of welding, in which case the requirement will be hereinafter detailed.

(4) Inspection of Boilers.

(a) A boiler constructed in accordance with 522 CMR 5.00 and shop inspected by an authorized inspector who is not commissioned in accordance with the National Board by-laws, shall be stamped MASS. HEAT together with the Mass. Heat number, and data shall be filed with the Chief of Inspections, Division of Inspection, Department of Public Safety.

5.05: continued

Data reports for other riveted or welded boilers shall be furnished the Chief of Inspections by the boiler manufacturer upon request.

All data reports to be signed by the manufacturer's representative.

All data reports for shop inspected boilers to be signed by the shop inspector.

(b) All boilers to which the code symbol is to be applied shall be built according to 522 CMR 5.00 by a manufacturer who is in possession of a code symbol stamp and a valid certificate of authorization. Each boiler shall be stamped with the Code symbol Shown in 522 CMR 5.05(4)(b): *Figures 1 and 2* with the following data:

FIGURE 1  
FORM OF STAMPING ON COMPLETED CAST IRON BOILERS  
OR THEIR NAMEPLATES

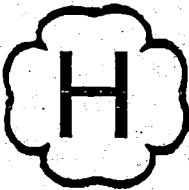
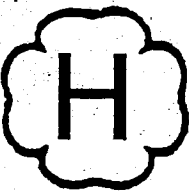
	_____
	(Name of Shop Assembler)
	Maximum W.P.      Steam 15 psi Water ____ psi
Minimum relief capacity lb/hr or MBH	

FIGURE 2  
BOILERS SUITABLE FOR WATER ONLY

	_____
	(Name of Shop Assembler)
	Maximum W.P.      Water ____ psi
Minimum relief capacity lb/hr or MBH	

5.05: continued

(5) Stamping requirements for Boilers Other than those Constructed Primarily of Cast Iron (See 522 CMR 5.05(4)(b): *Figure 1*)

(a) All boilers to which the Code Symbol is to be applied shall be built according to valid Certificate of Authorization. Each boiler shall be marked, stamped, or cast with the Code symbol used for heating boilers, and with the following data:

1. manufacturer's name;
2. maximum allowable working pressure;
3. safety or safety relief valve capacity (minimum), lb/hr or MBH;
4. manufacturer's serial number;
5. year built

**NOTE:** the year built may be incorporated into the serial number as a prefix consisting of the last two digits of the year.

(b) 522 CMR 5.05(5)(a)1. through 5. with the markings arranged substantially as shown in figure 1 shall be stamped with letters at least 5/16" high and in some conspicuous place on the boiler proper or on a stamping plate at least 3/64" thick permanently fastened to the boiler proper. The location of the stamping shall be as follows:

1. Horizontal Tubular Flue Type Boilers: on the front head above the central rows of tubes or flues.
2. Locomotive Firebox, Compact, or Vertical Firetube Type Boilers: over or near the fire door or handhole or washout plug opening on the front end or side.
3. Watertube Type Boilers: on a head of the top outlet drum. Waterwalls and headers shall carry identifying markings.
4. Split-Section and Section Firebox Type Wrought Boilers: over or near the fire door or handhole or washout plug opening on the front end or side. Each section shall carry identifying markings.
5. Scotch Type Boilers: on either side of the shell near the normal water level line adjacent to the front tubesheet.

(c) on any of the above type boilers where there is not sufficient space in the places designated and on other types and new designs of boilers, the stamping plates shall be located in a conspicuous place.

(d) The stamping or stamping plate on the boiler proper shall not be covered with insulating or other material unless:

1. the required stamping and arrangement thereof is duplicated and located in a conspicuous place on the jacket or other form of casing either on metallic plate, not less than 3" x 4" in size and permanently attached to the casing or stamped directly thereon;
2. If a nameplate is also used, it shall be of nonferrous material, shall be permanently fastened to the boiler casing, and shall be marked with letters and numerals at least 1/8" high.

(6) Marking Requirements for Cast Iron Boilers

(a) All boiler parts or sections to which the Code Symbol is to be applied shall be built according to 522 CMR 5.05 by a manufacturer who is in possession of a Code Symbol Stamp and a valid Certificate of Authorization. Each boiler section, including end and intermediate cored sections, shall be cast with the Code Symbol for Heating Boilers, and with the following data cast in letters or numerals at least 5/16" high:

1. manufacturer's name or acceptable abbreviation;
  2. maximum allowable working pressure;
  3. pattern number;
  4. casting date;
  5. shop assemblers name or acceptable abbreviation (if different from manufacturer).
- Other data may be cast on the sections. The marking "ASME" or "ASME Standard" shall not be used.

(b) When the boiler size and number of sections have been decided, the completed boiler shall be marked with the Code Symbol for Heating Boilers and with the following data:

1. Shop assembler's name
2. maximum allowable working pressure
3. safety or safety relief valve capacity (minimum) lb/hr or MBH

## 5.05: continued

(c) Permission to use the A.S.M.E. Symbol will be granted by the Society pursuant to 522 CMR 5.05(6)(c). Any manufacturer or assembler may apply to the Boiler Code Committee of the Society upon form issued by the Society, for the permission to use the appropriate stamp or stamps. Each applicant must agree that if permission to use any such stamp is granted, it will be used according to the rules and regulations of this code and that any such stamps will be promptly returned to the Society upon demand, or in case the applicant discontinues the manufacture or assembly of the above, or in the case the certificate of authorization issued to such applicant has expired and no new certificate has been issued. The holder of any such stamps shall not permit any other manufacturer or assembler to use his stamps.

Permission to use such stamps may be granted or withheld by the Society in its absolute discretion. If permission is given, and the proper administrative fee paid, a certificate of authorization evidencing permission to use any such symbol, will be forwarded to the applicant. Each such certificate will be signed by the Chairman and Secretary, or other authorized officer or officers, of the Boiler Code Committee. Six months prior to the date of expiration of any such certificate, the applicant must apply for a renewal or such permission and the issuance of a new certificate.

The Society reserves the absolute right to cancel or refuse to renew such permission returning fees paid for pro-rated unexpired term.

The Boiler Code Committee may at any time and from time to time make such regulations concerning the issuance and use of such stamps as it deems appropriate, and all such regulations shall become binding upon the holders of any valid certificates of authorization.

All steel stamps used for applying the symbol shall be purchased from the Society.

(d) No accessory or part of a boiler must be marked "ASME" or "ASME STANDARD" unless so specified in the Code.

(7) Welded H Symbol. The manufacturer of welded H Symbol shall construct the boilers to be marked with the Code according to the requirements of the Code. Inspection shall be made by an authorized inspector. The inspector procedure by which the inspector assures himself that the manufacturer is complying with all the requirements of the Code is the responsibility of the authorized inspector.

The inspector shall make such inspections as he believes are needed to enable him to certify that the boilers have been constructed in accordance with the A.S.M.E. Code. The authorized inspector shall be a state inspector, a municipal inspector or an inspector employed regularly by an insurance company. This inspector shall have been qualified by written examination under the rules of any state which has adopted the Code.

(8) Identification Plate. Each plate of a completed boiler shall bear the plate maker's name with the brand and tensile strength. If the boiler is inspected during construction by an authorized inspector and the inspector assures himself that the plate material conforms to the A.S.M.E. Code requirements, the plate maker's marks need not appear after completion of the boiler.

5.06: Cast Iron Boilers

522 CMR 5.06 shall apply to the construction of cast iron boilers.

(1) Maximum Allowable Working Pressure. Wherever the term "maximum allowable working pressure" is used herein, it refers to gage pressure or the pressure above the atmosphere in pounds per square inch.

(2) Marking of Boilers.

(a) All boilers built according to 522 CMR 5.00, and no other boilers, shall be plainly and permanently either marked, stamped, or cast with the symbol for heating boilers, and the minimum safety valve capacity required when the size and number of sections has been decided. The markings shall consist of:

1. Manufacturer's name, or manufacturer's and distributor's name.
2. The maximum allowable working pressure.



## 5.06: continued

3. Capacity (for determining safety valve capacity) showing the greatest maximum output in BTU's per hour (1,000 BTU's = 1 pound of steam). 522 CMR 5.06(2)(a)1. and 2. in letters and figures at least 5/16" high shall be stamped or cast on all of the cored sections. 522 CMR 5.06(2)(a)1., 2., and 3. shall be marked on the completed boiler or casing in some conspicuous place with letters and figures at least 5/16" high. If a name plate is used, it is to be of nonferrous material permanently attached to the boiler casing, the letters and figures to be not less than 1/8 inch high.

(b) Boilers suitable for use for both steam and water shall have marking arranged substantially as shown in figure 1. Stamping shall not be covered with insulating or other material except when a casing or other form of cover applied to the boiler is so arranged that it is not desirable to provide an opening through which the required stamping shall also be placed on a metallic plate not less than three by four inches in size irremovably attached to the front portion of the casing, or stamped directly thereon.

Permission to use the symbol referred to in 522 CMR 5.06 will be granted by the Boiler Code Committee of the Society pursuant to the provisions set forth by the A.S.M.E.

5.07: Installation, Fittings and Appliances

522 CMR 5.07 shall apply to the installation, fittings and appliances of steel plate and cast iron steam boilers.

NOTE: If a rule is applicable only to steel plate or cast iron boilers it will be so stated in the rule.

(1) Heating Surface. The heating surface shall be computed as follows:

(a) Heating surface, as part of a circulating system in contact on one side with water or wet steam being heated and on the other side with gas or refractory being cooled, shall be measured on the side receiving heat.

(b) Boiler heating surface and other equivalent surface outside the furnace shall be measured circumferentially plus any extended surface.

(c) Waterwall heating surface and other equivalent surface within the furnace shall be measured as the projected tube area (diameter x length) plus any extended surface on the furnace side. In computing the heating surface for this purpose, only the tubes, fireboxes, shelis, tubesheets, and the projected area of headers need be considered, except that for vertical firetube steam boilers, only that portion of the tube surface up to the middle of the gage glass is to be computed.

(2) Valve Capacity. The minimum valve capacity in pounds per hour shall be greater of that determined on the basis of pounds of steam generated per hour per square foot of boiler heating surface as given in 522 CMR 5.07: Table 2. In many cases a greater relieving capacity of valves will have to be provided than the minimum specified by 522 CMR 5.00. In every case, the requirement of 522 CMR 5.07(4)(a) shall be met.

(3) Safety Relief Valve Requirements for Hot Water Boilers. Each hot water heating boiler shall have at least one officially rated pressure relief valve set to relieve at or below the maximum allowable working pressure of the boiler. Each hot water supply boiler shall have at least one officially rated safety relief valve or at least one officially rated pressure-temperature relief valve of the automatic re-seating type set to relieve at or below the maximum allowable working pressure of the boiler. Safety relief valves officially rated as to capacity shall have pop action when tested by steam. When more than one safety relief valve is used on either hot water heating or hot water supply boilers, the additional valve or valves shall be officially rated and may be set within a range not to exceed 6 p.s.i. above the maximum allowable working pressure of the boiler up to and including 60 p.s.i. and 5% for those having a maximum allowable working pressure exceeding 60 p.s.i. Safety relief valves shall be spring loaded. Safety relief valves shall be so arranged that they can not be reset at a higher pressure than the maximum permitted by 522 CMR 5.07.

(4) Thermal Elements for Pressure-Temperature Relief Valves. The thermal elements for pressure-temperature relief valves shall be so designed and constructed that they will not fail in any manner which could obstruct flow passages or reduce capacities of the valves when the elements are subjected to steam temperatures.

## 5.07: continued

**NOTE:** Since the temperature elements are designed for temperatures up to only 250°F, they will fail when subjected to steam pressures with corresponding saturation temperatures in excess of 250°F.

- (a) The valve capacity for each boiler shall be such that with the fuel burning equipment installed, the pressure cannot rise more than five pounds above the maximum allowable working pressure.
  - (b) When operating conditions are changed, or additional boiler heating surface is installed, the valve capacity shall be increased, if necessary, to meet the new conditions and be in accordance with the A.S.M.E. Code. The additional valves required, on account of changed conditions, may be installed on the outlet piping provided there is not intervening valve.
- (5) **Size Required.** When solid fuel is used, the minimum size of the safety valve or valves for each boiler shall be determined by the amount of grate area as given in 522 CMR 5.07: *Table 2*.

TABLE 2  
MINIMUM POUNDS OF STEAM PER HOUR  
PER SQUARE FOOT OF HEATING SURFACE

	Firetube Boilers	Watertube Boilers
<i>Boiler Heating Surface</i>		
Hand fired	5	6
Stoker fired	7	8
Oil, gas, or pulverized fuel fired	8	10
Single pass fire tube	12	
<i>Waterwall Heating Surface</i>		
Hand fired	8	8
Stoker fired	10	12
Oil, gas or pulverized fuel fired	14	16

**NOTES:**

- (1) When a boiler is fired only by a gas having a heat value not in excess of 200 BTU's/cubic foot, the minimum safety valves or safety relief valve capacity may be based on the values given for hand fires boilers above.
- (2) The minimum safety valve or safety relieving capacity for electric boilers shall be 3½ pounds per hour per kW input.
- (3) For heating surface determination, see HG-403 of Section IV of the A.S.M.E. Code.
- (6) **Boiler Horsepower.** As determined by the manufacturer.
  - (a) **Equivalent Boiler Horsepower.** When liquid or gaseous fuel, electric or atomic energy or any other source of heat is use the horsepower of a boiler shall be based on the relieving capacity or aggregate relieving capacity of the safety valve or valves, divided by 34.5, when the safety valve or valves are set to blow at a pressure exceeding 25 pounds per square inch.

## 5.07: continued

(b) When liquid or gaseous fuel, electric or atomic energy or any other source of heat is used the horsepower of a boiler shall be based on the relieving capacity or aggregate relieving capacity of the safety valve or valves, divided by 34.5 divided by two, when the safety valve or valves are set to blow at 25 pounds per square inch or less.

(7) Steam Gages. Each steam boiler shall have a steam gage connected to its steam space, or to its water column, or to its steam connection by means of a siphon or equivalent device exterior to the boiler and of sufficient capacity to keep the gage tube filled with water and so arranged that the gage cannot be shut off from the boiler except by a cock with tee or lever handle, placed in the pipe near the gage. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open. The scale on the dial of a steam boiler gage shall be evenly graduated to not less than 30 pounds. The gage shall be provided with effective stops for the indicating pointer at the zero point and at the maximum pressure point. The travel at the pointer from zero to thirty pounds pressure shall be at least three inches. Connection to steam gage siphons shall be of nonferrous metal when smaller than one inch pipe size and longer than five feet between the siphon and point of connection of pipe to the boiler, and also when smaller than  $\frac{1}{2}$ " pipe size and shorter than five feet between the siphon and the point of connection of pipe to boiler. On compound gage, effective stops shall be set at the limits of the gage readings on both the pressure and vacuum sides.

(8) Test Connection. Each boiler shall be provided with a  $\frac{1}{4}$ " connection between the siphon and the gage or attaching inspector's test gage when boiler is in service, so that accuracy of the boiler steam gage can be ascertained.

(9) Water Gage Glasses.

(a) Each steam boiler shall have one or more water gage glasses attached to the water column or boiler by means of valves fittings not less than  $\frac{1}{2}$ " pipe size, with the lower fitting provided with a drain valve of a type having an unrestricted drain opening not less than  $\frac{1}{4}$ " in diameter to facilitate cleaning. Gage glass replacement shall be possible under pressure. Water glass fittings may be attached directly to a boiler.

(b) The lowest visible part of the water gage glass shall be at least one inch above the lowest permissible water level recommended by the boiler manufacturer. With the boiler operating at this lowest permissible water level, there shall be not danger of overheating any part of the boiler.

Each boiler shall be provided at the time of the manufacture with a permanent marker indicating the lowest permissible water level. The marker shall be stamped, etched, or cast in metal, or it shall be a metallic plate attached by rivets, screws, or welding, or it shall consist of material with documented tests showing its suitability as a permanent marking for the application. This marker shall be visible at all times. Where the boiler is shipped with a jacket, this marker may be located on the jacket.

NOTE: Transparent material other than glass may be used for the water gage provided that the material will remain transparent and has proved suitable for the pressure, temperature, and corrosive conditions expected in service.

(c) In electric boiler of the submerged electrode type, the water gage glass shall be so located to indicate the water levels both at startup and under the maximum steam load conditions as established by the manufacturer.

(d) In electric boilers of the resistance heating element type the lowest visible part of the water gage glass shall also be equipped with an automatic low water electrical power cutoff so located as to automatically cut off the power supply before the surface of the water falls below the top of the electrical resistance heating elements.

(e) Tubular water glasses on electric boilers having a normal water content not exceeding 100 gallons shall be equipped with a protective shield.

(10) Pressure Control. Each automatically fired steam boiler shall be protected from over pressure by two pressure operated controls.

(a) Each individual automatically fired steam boiler shall have a safety limit control that will cut off the fuel supply to prevent steam pressure from exceeding the 15 p.s.i. maximum allowable working pressure of the boiler. Each control shall be constructed to prevent a pressure setting above 15 p.s.i.

## 5.07: continued

(b) Each individual steam boiler or each system of commonly connected steam boilers shall have a control that will cut off the fuel supply when the pressure reaches an operating limit, which shall be less than the maximum allowable pressure.

(c) Shutoff valves of any type shall not be placed in the steam pressure connection between the boiler and the controls described in 522 CMR 5.07(10)(a) and (b). These controls shall be protected with a siphon or equivalent means of maintaining a water seal that will prevent steam from entering the control. The connections to the boiler shall not be less than ¼ standard pipe size, but where steel or wrought iron pipe or tubing is used, they shall not be less than ½ inch standard pipe size. The minimum size of a siphon shall be ¼ inch standard pipe size or ¾" O.D. nonferrous tubing.

(11) Automatic Low Water Fuel Cutoff and/or Water Feeding Device.

(a) Each automatically fired steam or vapor-system boiler shall have an automatic low water fuel cutoff so located as to automatically cut off the fuel supply when the surface of the water falls to the lowest visible part of the water gage glass. If a water feeding device is installed, it shall be so constructed that the water inlet valve cannot feed water into the boiler through the float chamber and so located as to supply requisite feedwater.

(b) Such a fuel cutoff or water feeding device may be attached directly to a boiler. A fuel cutoff or water feeding device may also be installed to the tapped openings available for attaching a water glass direct to a boiler, provided the connections are made to the boiler with nonferrous tees or Y's not less than ½ inch pipe size between the boiler and the water glass so that the water glass is attached directly and as close as possible to the boiler; the run on the tee or Y shall take the fuel cutoff or water feeding device. The ends of all nipples shall be reamed to full size diameter.

(c) Fuel cutoffs and water feeding devices embodying a separate chamber shall have a vertical drain pipe and blowoff valve not less than ¾ inch pipe size, located at the lowest point in the water equalizing pipe connections so that the chamber and the equalizing pipe can be flushed and the device tested.

(d) Hot water boilers having a submerged automatic low water cut out chamber device must be installed so that the low water cut out can cause the boiler to shut off on manual test.

(12) Pressure or Altitude Gage.

(a) Each hot water heating boiler shall have a pressure or altitude gage connected to its flow connection in such a manner that it cannot be shut off from the boiler except by a cock with tee or lever handle, placed on the pipe near the gage. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open.

(b) The scale on the dial of the pressure or altitude gage shall be graduated approximately to not less than 1½ nor more than three times the pressure at which the safety relief valve is set.

(c) Piping or tubing for pressure or altitude gage connections shall be nonferrous metal when smaller than one inch pipe size.

(13) Thermometers. Each hot water boiler shall have a thermometer so located and connected that it shall be easily readable when observing the water pressure or altitude. The thermometer shall be so located that it shall at all times indicate the temperature in degrees Fahrenheit of the water in the boiler at or near the outlet. The thermometer may be combined with the pressure gage within a single instrument case if a standard instrument is used.

(14) Temperature Control. Each automatically fired hot water heating boiler shall be protected from over temperature by two temperature operated controls.

(a) Each individual automatically fired hot water heating boiler shall have a safety limit control that will cut off the fuel supply to prevent water temperature from exceeding the maximum allowable temperature of 250°F at the boiler outlet. This water temperature safety control shall be constructed to prevent a temperature setting above 250°F.

(b) Each individual hot water boiler or each system of commonly connected boilers without intervening valves shall have a control that will cut off the fuel supply when the water temperature reaches an operating limit, which shall be less than the maximum allowable temperature.

## 5.07: continued

(15) Low Water Fuel Cutoff.

- (a) Each automatically fired hot water heating boiler with heat output greater than 200,000 BTU's/hr shall have an automatic low water fuel cutoff which has been designed for hot water service and it shall be so located as to automatically cut off the fuel supply when the surface of the water falls to the level established in 522 CMR 5.07(15)(b).
- (b) As there is no normal waterline to be maintained in a hot water heating boiler, any location of the low water fuel cut off above the lowest safe permissible water level established by the boiler manufacturer is satisfactory.
- (c) A coil type boiler or a watertube boiler with heat input greater than 200,000 BTU's/hr requiring forced circulation to prevent overheating of the coils or tubes shall have a flow sensing device installed in the outlet piping in lieu of the low water fuel cutoff required in 522 CMR 5.07(15)(a) to automatically cut off the fuel supply when the circulating flow is interrupted.
- (d) Low water cutoffs for heating boiler shall have a means for testing the operation of the device without resorting to draining the entire system. Such means shall not render the device unsafe or inoperable.

(16) Electrical Code Compliance. All field wiring for controls, heat generating apparatus, and other appurtenances necessary for the operation of the boiler or boilers shall be installed in accordance with the provisions of the national Electric Code and must comply with the applicable local electrical codes. All boilers supplied with factory mounted and wired controls, heat generating apparatus, and other appurtenances necessary for the operation of the boilers shall be installed in accordance with the provisions of the nationally recognized standards.

(17) Type Circuitry to be Used. Whether field or factory wired, the control circuitry shall be positively grounded and shall operate at 150 V or less. One of the two following systems may be employed to provide the control circuit:

- (a) Two-wire Nominal 120 V System with Separate Equipment Ground Conductor
  - 1. This system shall consist of the line, neutral, and equipment ground conductors. The control panel frame and associated control circuitry metallic enclosures shall be electrically continuous and be bonded to the equipment ground conductor.
  - 2. The equipment ground conductor and the neutral conductor shall be bonded together at their origin in the electrical system as required by Appendix H of Section IV of the A.S.M.E. Code.
  - 3. The line side of the control circuit shall be provided with a time delay fuse sized as small as practicable.
- (b) Two-wire Nominal 120 V System Obtained by Using an Isolation Transformer
  - 1. The two-wire control circuit shall be obtained from the secondary side of an isolation transformer. One wire from the secondary of this transformer shall be electrically continuous and shall be bonded to a convenient cold water pipe. All metallic enclosures of control components shall be securely bonded to this ground control circuit wire. The primary side of the isolation transformer will normally be a two wire source with a potential 230 or 208 V or 440 V.
  - 2. Both sides of the two wire primary circuit shall be fused. The hot leg on the load side of the isolation transformer shall be fused as small as practicable and in no case fused above the rating of the isolation transformer.

(18) Limit Controls. Limit controls shall be wired on the hot or line side of the control circuit.

(19) Shutdown Switches and Circuit Breakers. A manually operated remote heating plant shutdown switch or circuit breaker should be located just outside the boiler room door and marked for easy identification. Consideration should also be given to the type and location of the switch to safeguard against tampering. If the boiler room door is on the building exterior the switch should be located just inside the door. If there is more than one door to the boiler room, there should be a switch located at each door. In any case, the requirements of the State Fire Marshall relating to oil burner controls must be complied with.

522 CMR: BOARD OF BOILER RULES

5.07: continued

(20) Controls and Heat Generating Apparatus.

(a) Oil and gas fired and electrically heated boilers shall be equipped with suitable primary (flame safeguard) safety controls, safety limit switches, and burners or electric elements as required by a nationally recognized standard.

(b) The symbol of the certifying organization which has investigated such equipment as having complied with a nationally recognized standard shall be affixed to the equipment and shall be considered as evidence that the unit was manufactured in accordance with that standard.

REGULATORY AUTHORITY

522 CMR 5.00: M.G.L. c. 146, §§ 81 through 85; M.G.L. c. 30, § 37; M.G.L. c. 30A, § 5; M.G.L. c. 22, § 10A.

## 522 CMR: BOARD OF BOILER RULES

### 522 CMR 6.00: LOW PRESSURE HEATING BOILERS

#### Section

#### 6.01: Scope and Application

##### 6.01: Scope and Application

(1) In accordance with the provisions of M.G.L. c. 146, § 2, the Board of Boiler Rules herewith adopts by reference the provisions of RULES FOR CONSTRUCTION OF LOW-PRESSURE HEATING BOILERS, 1998 Edition, with 1999 addenda, formulated and published by the American Society of Mechanical Engineers, as ASME BOILER AND PRESSURE VESSEL CODE SECTION IV.

(2) The amendments herein, including deletions and/or additional requirements, shall take effect six months after publication by the Secretary of the Commonwealth, provided the Board may upon request, permit application of the amended rules to installations made during said six months.

(3) 522 CMR 6.00 shall be applicable insofar as it pertains to construction and appurtenances of low-pressure heating boilers which come within the scope of M.G.L. c. 146.

#### REGULATORY AUTHORITY

522 CMR 6.00: M.G.L. c. 146, § 2.

NON-TEXT PAGE



## 522 CMR 7.00: AIR TANKS

## Section

- 7.01: Scope
- 7.02: Corrosion Protection
- 7.03: Stamping
- 7.04: Data Reports
- 7.05: UM Stamping

7.01: Scope

- (1) 522 CMR 7.00 applies to the following:
  - (a) Tanks hereafter constructed.
  - (b) Tanks used for the storage of one cubic foot or more of compressed air at a pressure exceeding 50 p.s.i. The exemption of tanks containing less than one cubic foot of air applies to each single vessel and not to an assembly of vessels.
  - (c) Tanks in which compressed air is used to discharge the contents of the tank, for example, air and oil tanks used with automobile lifts, paint spraying tanks, and abrasive blast tanks.
  - (d) Tanks in which air is used in the process of impregnating materials.
  - (e) Intercoolers and aftercoolers which are not integral parts of compressors, air purifiers, reheaters and similar vessels used in a compressed air system.
- (2) 522 CMR 7.00 does not apply to the following:
  - (a) Tanks subject to Federal control.
  - (b) Tanks attached to locomotives, street cars, railway cars, trackless trolley vehicles, or to motor vehicles for use in operating such vehicles or their brakes or body lifting apparatus.
  - (c) Tanks in which air is used solely for cushioning systems containing water or other liquids.
  - (d) Tanks having an inside diameter of six inches or less.
  - (e) Tanks containing air and liquids in which the pressure is maintained by pumps; for example, hydraulic elevator tanks.
  - (f) A tank or other receptacle used by divers if such tank or other receptacle is inspected by the refilling agency.
- (3) In accordance with the provisions of M.G.L. c. 146, § 2, the Board of Boiler Rules herewith adopts by reference the 1998 A.S.M.E. Boiler and Pressure Vessel Code Section VIII Division 1, with 1999 addenda.

7.02: Corrosion Protection

Every air tank shall be provided with tapped openings for drains at the lowest point practicable. The minimum size of such openings shall be  $\frac{1}{2}$ " except for tanks 20" diameter or less, in which case the minimum size of such opening shall be  $\frac{1}{4}$ ". In the case of vertical tanks the bottom head, if dished, must have the pressure on the concave side to insure complete drainage.

7.03: Stamping

- (1) Every air tank shall conform in all details with 522 CMR 7.00 and when so constructed shall be stamped as provided in Pars. UG 115 and UG 116--UG 117--UG 118--UG 119.
- (2) A manufacturer who desires to construct air tanks for use in Massachusetts shall make written application to the Board of Boiler Rules for permission to construct such tanks and receive written authority from the Board before taking any steps toward furnishing tanks within the scope of 522 CMR 7.00 for use in Massachusetts.
 

The manufacturer shall furnish the Board such information as may be required to determine that he has the equipment and is otherwise qualified to fabricate tanks by the methods covered by his application and has made arrangements for shop inspection as required by 522 CMR 7.00. A facsimile of the proposed stamping shall accompany the application.

## 7.03: continued

- (3) Each tank inspected by a qualified inspector in accordance with Par. UG 91 shall bear the stamping of the National Board of Pressure Vessel Inspectors and the National Board number or the words MASS STANDARD abbreviated to read MASS STD and the MASS STD number.
- (4) A "part" of an air tank requiring inspection shall bear the stamping of the National Board of Pressure Vessel Inspectors or the words MASSACHUSETTS STANDARD abbreviated to read MASS STD.

7.04: Data Reports

- (1) A data report on forms to be approved by the Division of Inspection of the Department of Public Safety, shall be forwarded by the builder to the Chief of Inspections of such Department for each air tank stamped MASS STD before the tank is shipped from the shop of the builder.
- (2) Data reports for air tanks stamped with the symbols of The American Society of Mechanical Engineers and the National Board of Pressure Vessel Inspectors but without MASS STD stamping shall be filed in accordance with National Board Regulations.

7.05: UM Stamping

- (1) Air tanks that are stamped or have nameplates in accordance with paragraph UG-119 and which have the ASME official code of UM symbol as shown in figure UG-116(b) and with the additional information required by paragraph UG-116(b), and which are constructed in accordance with the provisions in paragraph U-1H with the exceptions and conditions delineated in 522 CMR 7.05(2) and (3), will be acceptable for use within the Commonwealth of Massachusetts provided that the air tank does not
  - (a) contain more than five cubic feet of compressed air
  - (b) exceed 250 p.s.i.g. design pressure.
- (2) Manufacturers of air tanks as defined in 522 CMR 7.05(1) must register with the Commonwealth of Massachusetts, Department of Public Safety, Division of Inspection, Engineering Section, before producing any air tanks that will be stamped UM for use within the commonwealth and annually thereafter. The following notarized information shall be furnished to the department. In the event of any changes in the information that is required, such changes, properly notarized, shall be submitted to the department within 30 days of the change.
  - (a) Name and legal address of the company or corporation.
  - (b) Name and legal address of the officers of the company, corporation or partnership.
  - (c) The name and address of the third party inspection agency and the authorized inspector.
  - (d) Two sets of each of the following, all to be signed and stamped with the seal of a Massachusetts Registered Professional Engineer with recognized competence in the fields of pressure vessel design and welding engineering:
    - 1. Detailed drawings of the tank, heads, joint geometry, penetrations, supports, girth and longitudinal joints.
    - 2. A full and complete set of calculations as required by the ASME code in simple arithmetic or algebra (no computer calculations).
    - 3. Approved welding procedures as required by Section VIII of ASME (by third party inspection agency).
    - 4. A U-3 form for each tank to be shipped into Massachusetts.

7.05: continued

(3) Manufacturers that produce air receivers as defined in 522 CMR 7.05(1) and (2) must also agree to bear the full expense of a two man survey team of District Engineering Inspectors, employed by the Commonwealth of Massachusetts, for the certification of their shop. An annual re-survey of the shop may be made on a "surprise basis" also at the full expense of the manufacturer. An annual report must be submitted by the manufacturer, to the department, certified by his third party inspection agency that full compliance with his manufacturer's written procedures has been maintained.

REGULATORY AUTHORITY

522 CMR 7.00: M.G.L. c. 146, §§ 34 through 41; c. 22, § 10A.

NON-TEXT PAGE

## 522 CMR 8.00: EXISTING AIR TANKS

## Section

- 8.01: Scope
- 8.02: Installation
- 8.03: Protective Devices
- 8.04: Attachment of Pipe and Fittings
- 8.05: Safety Valves
- 8.06: Gages, Drains and Saddles
- 8.07: Inspections and Certificates
- 8.08: Welded Repairs, Major Repairs Alterations

8.01: Scope

522 CMR 8.00 applies to air tanks now or hereafter installed unless otherwise indicated by a note preceding a paragraph.

No regulations for the construction of air tanks are included in 522 CMR 8.00.

Tanks containing air and oil for the operation of automobile lifts or hydraulic machinery are exempt from the periodical inspection requirements but are subject to the requirements of 522 CMR 8.07(1).

8.02: Installation

(1) All tanks shall be available for complete external inspection and shall be so installed that there will be not less than 12" between the tank and any floor, wall, ceiling or other obstruction, except where a tank is attached to a portable compressor by means of straps and is removable for complete inspection.

(2) In case of vertical tanks the bottom head if dished must have the pressure on the concave side to insure complete drainage.

8.03: Protective Devices

All tanks shall be protected by such safety valves and indicating and controlling devices as will insure their safe operation. These devices shall be so constructed, located and installed that they cannot readily be rendered inoperative.

8.04: Attachment of Pipe and Fittings

**NOTE:** 522 CMR 8.04 applied to pipe and fittings hereafter installed.

No piping, drains, safety valves, pressure gages or other appurtenances shall be connected to threaded openings required for inspection and cleanout purposes.

8.05: Safety Valves

Safety valves must be ASME and NB approved and stamped.

(1) Safety Valve Springs. Safety valve springs shall not be adjusted to carry more than 10% greater pressure than that for which the springs were made.

(2) Safety Valve--Set Pressure. At least one safety valve at each location where safety valves are required shall be set to operate at or below the maximum allowable working pressure.

(3) Safety Valve Relieving Capacity Required.

(a) The relieving capacity of the safety valve or valves shall be sufficient to prevent a rise of pressure in the system of more than 10% above the maximum allowable working pressure.

(b) The minimum capacity of a safety valve or valves required shall be governed by the pressure allowed and by the maximum rating (sea level pressure and 60°F) of the compressor which shall be the piston displacement in cubic feet per minute at the maximum speed of the air compressor. In the case of multi-stage compressors only the piston displacement of the first stage cylinder shall be used.

## 8.05: continued

(c) The minimum safety valve relieving capacity required for a rotary compressor shall be based on the compressor manufacturer's rating.

(4) Safety Valve Capacity--Means of Determining.

(a) When a bevel seat safety valve is constructed in accordance with 522 CMR 8.00, except that it does not bear the capacity marking required by 522 CMR 8.05(4)(c), the acceptable capacity shall be that found in 522 CMR 8.05: *Table 1* for bevel seat safety valves.

(b) In applying 522 CMR 8.05: *Table 1* to flat seat safety valves marked "FLAT SEAT" by the maker but without the capacity marking required by 522 CMR 8.05(4)(c) the capacity values found in 522 CMR 8.05: *Table 1* may be multiplied by 1.4.

(c) When a safety valve is constructed in accordance with 522 CMR 8.00 and the capacity in cubic feet of free air per minute is marked on it by the manufacturer, that capacity may be accepted providing the following information is also included in the marking:

1. Name or identifying trade mark of the manufacturer.
2. Size in inches (pipe size of valve inlet).
3. Pressure in pounds (pressure at which it is to blow).
4. Relieving capacity in cubic feet of free air per minute.

The marking may be stamped or cast on the casing or stamped or cast on a plate or plates securely fastened to the casing and shall be so marked that the marking will not be obliterated in service.

(d) A safety valve constructed in accordance with 522 CMR for use with steam, when not of over three inch size and having the capacity in pounds of steam per hour marked on it by the maker, may be used for air and its capacity in terms of cubic feet of free air per minute shall be found by multiplying the capacity in pounds of steam per hour by .325. This rule shall apply only when the safety valve is set to blow at a pressure not lower than that marked on it by the maker.

(5) Safety Valve--Connection to System.

(a) Each safety valve shall have full size direct connection to an air compressor system. No valve or other device that can be positively closed against the flow from the compressor shall be placed between the safety valve and the compressor. When two or more safety valves are placed on one connection this connection shall have a cross-sectional area equal to or greater than the combined area of these safety valves. All tanks, the contents of which are likely to cause interference with the operation of a safety valve if attached directly to the tank, shall have the safety valve connected in such manner as to avoid such interference. Intercoolers and aftercoolers shall not be classed as primary vessels but shall be protected by adequate safety valves. When the safety valves in the installations covered by 522 CMR 8.05(5)(b) and (c) are exposed to the elements and freezing temperatures they shall be located on the discharge pipe from the compressor as near the compressor as practical.

(b) When the installation consists of one tank and one compressor the safety valve may be installed on the discharge pipe from the compressor or on the tank or near the tank on its outlet pipe.

(c) When two or more tanks are used with one compressor and air passes through the first tank known as the primary tank, the safety valve may be installed on the discharge pipe from the compressor or on the primary tank or near the primary tank on its outlet pipe.

(d) When two or more tanks allowed the same working pressure receive air direct from a compressor (primary tanks) the safety valve shall be installed on the discharge pipe from the compressor as close to the compressor as practical.

(e) When two or more compressors are discharging into a common main, the safety valve shall be installed on the discharge pipe from each compressor as close to the compressor as practical.

**NOTE:** Rupture disk requirements in 522 CMR 8.04(5)(f) apply only to tanks hereafter installed.

## 8.05: continued

(f) When two or more tanks allowed different working pressure are connected to the same system, a reducing valve shall be placed in the line to the tanks allowed the lower pressure, with a safety valve and an approved rupture disk or safety valve or valves of a capacity amounting to the maximum capacity of the reducing valve shall be provided on the line between the reducing valve and the tank. The inlet area of the safety valve and the pipe size of the rupture disk shall not be less than that of the line to which they are attached and both protective devices shall have full size independent connection to the line. The safety valve shall be set to operate at or below the maximum pressure allowed on the reduced pressure tank and protected from the elements when exposed to freezing temperatures.

The rupture disk bursting pressure shall be at least 10% and not over 20% higher than the pressure allowed on the reduced pressure tank.

The point of discharge of the rupture disk shall be carried to a safe place and all piping arranged to prevent accumulation of water on either side of the disk.

(6) Safety Valve--Escape Pipe. When an escape pipe is used the point of discharge shall be carried to a safe place and no valve of any description shall be placed on the escape pipe between the safety valve and the atmosphere.

The cross-sectional area of an escape-pipe shall be greater than the outlet area of the safety valve or valves discharging through it, and at least equal to the full volume of air discharged from the safety valve or valves. There shall not in any case be any back pressure from the discharge pipe to the disk.

If an elbow is used it shall be located close to the safety valve outlet or the escape pipe shall be securely anchored or supported. An escape pipe shall be fitted with an open drain to prevent water from lodging in the safety valve or escape pipe.

(7) Monthly Test of Safety Valve. Each safety valve shall be tested at least once a month by raising the disk from the seat.

TABLE 1  
GUARANTEED MAXIMUM FREE AIR SUPPLIED IN CUBIC  
FEET PER MINUTE FOR DIFFERENT SIZES OF BEVEL SEATED  
SAFETY VALVES AT STATED PRESSURES

Diameter of valve	Gage Pressure															
	50	100	150	200	250	300	350	400	500	600	800	1000	1200	1600	2000	2400
$\frac{1}{8}$	12	20	27	33	38	43	48	53	61	70	84	97	109	128	147	160
$\frac{1}{4}$	17	27	36	44	51	58	65	72	83	95	115	133	149	176	197	215
$\frac{3}{8}$	20	32	42	51	59	67	74	111	129	147	177	205	230	270	304	330
$\frac{1}{2}$	37	59	78	96	112	127	141	176	224	232	242	346	386	423	474	518
1	58	94	124	152	178	202	224	248	286	324	390	450	500	586	...	...
$1\frac{1}{4}$	84	135	180	221	259	293	325	352	400	443	509	...	...	...	...	...
$1\frac{1}{2}$	114	186	248	302	354	400	444	478	528	568	634	...	...	...	...	...
2	189	306	410	501	592	668	741	...	...	...	...	...	...	...	...	...
$2\frac{1}{2}$	282	457	613	750	880	998	1114	...	...	...	...	...	...	...	...	...
3	393	638	856	1050	1230	1398	1557	...	...	...	...	...	...	...	...	...

8.06: Gages, Drains and Saddles(1) Pressure Gage.

(a) Every air compressor system shall have a pressure gage connected in a manner that the pressure gage cannot be shut off from the tank, except by a cock with a T or lever handle, which shall be placed on the pipe near the pressure gage. Gage connections shall be of brass pipe and fittings or copper tubing, so connected to the system that they will not be exposed to high temperatures due to compression. The minimum copper tubing size used shall be  $\frac{1}{8}$ ".

(b) The dial of the pressure gage shall be graduated to not less than  $1\frac{1}{2}$  times the maximum pressure allowed on the tank.

(2) Test Gage Connection.

(a) Each air-compressor system shall be provided with a  $\frac{1}{4}$ " pipe size connection for attaching inspector's test gage when the system is in service, so that the accuracy of the pressure gage can be ascertained.

(b) The test gage connection shall consist of a  $\frac{1}{4}$ " pipe size brass cock with T or lever handle and female thread and shall be connected to the pressure gage piping in such a manner that nothing shall obstruct the attachment of the inspector's test gages while the tank is in service.

(3) Bottom Drain Pipe. Each tank shall have a bottom drain pipe fitted with a valve or cock, of the straightway type, in direct connection with lowest water space practicable. The minimum size of pipe and fittings shall be  $\frac{1}{2}$ " except for tanks 20" in diameter or less, in which the minimum size of such pipe and fitting shall be  $\frac{1}{4}$  iron pipe size. If a plug cock is used, the plug shall be held in place with a guard or gland.

(4) Saddles.

NOTE: Previous criteria for the installation of saddles on air tanks are on file with the Department of Public Safety.

(a) Saddles may be welded to the top of the tank. If this is done they shall be so designed and installed as to permit a visual external inspection of the tank surface covered by the saddle, without the use of mirrors or other special inspection devices.

(b) The requirements of paragraph UG-22, Section VIII, Division I, ASME Code shall be met with respect to design and installation of saddles and feet for Air Tanks. Saddles and feet, if used, must be welded to Air Tanks by qualified welders using qualified procedures as delineated in Section IX of the ASME Code.

(c) Saddles strapped, belted, or otherwise removably attached to the tank shall conform to the requirements of 522 CMR 8.06(4)(a) and 8.06(4)(b).

8.07: Inspections and Certificates(1) Field Inspection.

(a) All tanks except those containing air and oil for the operation of automobile lifts or operating hydraulic machinery or tanks containing electrical equipment for use as air blast circuit breakers, shall be inspected by a district engineering inspector of the Division of Inspection, Department of Public Safety, or an inspector holding a Massachusetts Certificate of Competency as a Boiler Inspector and employed by an insurance company authorized to insure boilers and air tanks in this Commonwealth.

When a tank is installed a Field Inspection shall be made before it is put into service and the tank shall be inspected internally biennially thereafter.

If the installation is found to comply with 522 CMR 8.00 and the tank is constructed in accordance with 522 CMR 7.00, the inspector shall issue a certificate stating the pressure at which the tank will be permitted to operate.

(b) Every tank which has been inspected by the Division of Inspection shall be given a serial number by stamping the number upon the tank ((FN\*)) or upon a metal tag wired to the tank and secured with a lead seal, together with a symbol representing the seal of the Commonwealth preceding the number and following the number.

(c) Tanks containing air and oil for the operation of automobile lifts or operating hydraulic machinery or tanks containing electrical equipment for use as air blast circuit breakers, shall bear MASS. STD., or A.S.M.E. and NATIONAL BOARD code stampings for the maximum pressure they are to be subjected to.



## 8.07: continued

The owner or user of such a tank shall notify the Department of its location, and request approval of same, when the work of installation is completed and before it is put into service.

In all cases the stamping showing the code under which the tank was manufactured and the allowable working pressure shall be easily accessible to the inspector.

Tanks to be buried shall be left uncovered until approved by the inspector.

It is recommended that buried tanks be given an adequate protective coating against external corrosion.

(2) Form of Certificate. The standard size of the certificate of inspection, as authorized by M.G.L. c. 146, § 34, shall be that authorized by the Board and shall contain the information required by the Board and be issued for the length of time designated by the Board.

(3) Certificate to Be Posted. The certificate of inspection for a stationary tank shall be posted and protected from dirt, moisture, etc., in a conspicuous place in the air-compressor room near which the tank specified therein is located. THE CERTIFICATE OF INSPECTION FOR A PORTABLE AIR TANK SHALL BE KEPT WITH IT AND SHALL BE ALWAYS ACCESSIBLE. It shall not be removed therefrom while the certificate is in force unless the tank or its appendages becomes defective, when it shall be removed by a district engineering inspector of the Division of Inspection of the Department of Public Safety, or an inspector employed by an insurance company as provided by M.G.L. c. 146, § 34.

(4) Riveted Air Tanks. In determining the maximum allowable working pressure on the shell of a lap-riveted air tank over ten years old, the lowest factor of safety to be used shall be as follows:

(a) 5.5 for tanks over ten and not over 15 years old.

(b) 5.75 for tanks over 15 and not over 20 years old.

(c) 6 for tanks over 20 years old.

(FN\*) Stamping shall comply with Section VIII, Div. I, UG-118 and 119.

8.08: Welded Repairs, Major Repairs Alterations

(1) No repairs or alterations shall be done by the welding process without the previous approval of an authorized inspector. If in the opinion of the inspector a hydrostatic test is necessary, such test shall be applied when the work is completed.

The welded repairs or alterations shall be completed in accordance with the National Board Inspection Code, RULES FOR REPAIR AND ALTERATIONS BY WELDING. In no case shall the repair or alteration be required to be made to a higher degree than that to which the vessel was originally constructed.

(2) A crack in an air tank or other pressure vessel shall not be repaired by welding if it extends through the parent metal in a longitudinal direction or more than 30° from a line drawn perpendicular to the longitudinal joint. A patch may be used for such a repair if approved previously by an authorized inspector. Minor cracks originating around openings or nozzles may be repaired if previous approval is granted by an authorized inspector.

(3) The use of heat to a dull red color for the purpose of expanding the metal around an inspection or other opening, for removing threaded attachments, is expressly forbidden.

## REGULATORY AUTHORITY

522 CMR 8.00: M.G.L. c. 146, §§ 34 through 41; c. 22, § 10A.

NON-TEXT PAGE

## 522 CMR 9.00: REFRIGERATION AND AIR CONDITIONING SYSTEMS

## Section

9.01: General Provisions

9.02: Scope

9.03: Definitions

9.90: Safety Code for Mechanical Refrigeration

9.01: General Provisions

(1) Requirements for Inspection. Whoever owns or uses or causes to be used a refrigeration or air conditioning system that comes within the scope of M.G.L. c. 146, § 45A, shall make application for inspection to the Chief of Inspections on forms furnished by the department. The owner or user shall give his name and address and the location of the refrigeration or air conditioning system and return same to the department. The minimum fee for each inspection made by the division under 522 CMR 9.01 shall be \$40.00 and an additional fee of \$1.00 shall be charged for each ton above 20 tons; provided that the maximum fee shall be \$100.

(2) Annual Inspections. When a refrigeration or air conditioning system is installed a field inspection shall be made before it is put into service and the refrigeration or air conditioning system shall be inspected annually thereafter.

(3) Prescribed Pressure. A refrigeration or air conditioning system shall not be operated in excess of the prescribed pressure. If the refrigeration or air conditioning system is constructed and installed in accordance with the rules prescribed by the Board of Boiler Rules, the inspector shall issue a certificate stating the maximum pressure at which the system will be permitted to operate.

(a) Every refrigeration or air conditioning system which has been inspected by the Division of Inspection shall be given a serial number upon a metal tag together with a symbol representing the seal of the Commonwealth preceding and following the number. The tag shall be held by non-ferrous wire in a conspicuous place on the unit and no person except a District Engineering Inspector of the Division of Inspection shall remove the tag.

(b) Authorized insurance companies shall be furnished tag numbers by the Engineering section of the Division of Inspection for refrigeration and air conditioning systems. The authorized insurance companies shall furnish their own tags upon which shall be the tag number. The dimensions of the tag shall be that authorized by the board. The minimum size of the dies for stamping the tag shall be 5/16". The tag shall be made of non-ferrous metal and attached in a conspicuous place on the unit.

(4) Form of Certificate. The form of certificate shall be that authorized by the Board of Boiler Rules.

(5) Certificate to Be Posted. The certificate of inspection for a refrigeration or air conditioning system shall be posted and protected from dirt, water, and other deleterious effects in a conspicuous place near the compressor of the refrigeration or air conditioning system specified therein. It shall not be removed therefrom while the certificate is in force, unless the system or its appurtenances becomes defective, when it shall be removed by a District Engineering Inspector of the Division of Inspection of the Department of Public Safety or by a commissioned inspector who holds a Certificate of Competency as Inspector of Steam Boilers, to inspect pressure vessels issued by the Division of Inspection of the Department of Public Safety as provided by M.G.L. c. 146, § 62.

(6) Reports of Insurance Companies. Every insurance company shall forward to the Chief within 14 days after each inspection reports of all refrigeration or air conditioning systems inspected by it. Such reports shall be made on forms approved by the Chief of Inspections and shall contain all orders made by the company regarding such systems.

(7) Insurance Companies Shall Report New, Canceled or Suspended Risks. All insurance companies shall notify the Chief of Inspections within 14 days on forms approved by the Chief of Inspections of all refrigeration and air conditioning system risks written, canceled, not renewed or suspended because of unsafe conditions.

9.01: continued

- (8) Miscellaneous. Words underscored in the text have been specifically defined in 522 CMR 9.03 and are used in accordance with those definitions.
- (9) Welding. All welding done on any refrigeration system or piping covered by 522 CMR 9.00 shall be performed by a welder qualified according to Section IX of the A.S.M.E. Code.
- (10) Electrical. A person holding a license as a refrigeration technician may connect or disconnect for the purpose of installation, alteration, repair or replacement, any device or control required by rules and regulations of the board to be a part of a refrigeration or air conditioning installation, or being an integral part of the refrigeration or air conditioning equipment at the connection on such device, control or part to be repaired or replaced, from the first disconnect in. The first disconnect being the wall plug or nearest electrical disconnect to the refrigeration or air conditioning equipment. All electrical work shall be in accordance with the Massachusetts Electrical Code.

9.02: Scope

- (1) Scope. The application of 522 CMR 9.00 is intended to insure the safe design, construction, installation, operation and inspection of every refrigeration and air conditioning system that comes within scope of M.G.L. c. 146, § 45A.
- (2) Purpose. The purpose of 522 CMR 9.00 is to provide reasonable safety for life, limb, health and property by adopting such rules and regulations in accordance with nationally recognized standards of engineering practice which will properly influence future progress and development in refrigeration and air conditioning systems.
- (3) Requirements. The requirements of 522 CMR 9.00 shall apply to all installations that come within the scope of M.G.L. c. 146, § 45A.
- (4) Equipment. Equipment listed in 522 CMR 9.03(10) and recognized by the Board of Boiler Rules is deemed to meet the requirements of 522 CMR 9.00 or equivalent, for the refrigerant or refrigerants for which such equipment is designed.
- (5) Exceptions. In cases of practical difficulty or unnecessary hardship, the Board of Boiler Rules may grant exceptions from the literal requirements of 522 CMR 9.00, or permit the use of other devices or methods when it is clearly evident the equivalent protection is thereby secured.
- (6) Ton of Refrigeration. Is the removal of heat at a rate of 200 BTU per 522 CMR 9.00 one ton of refrigeration is equal to one horse power or one horse power is equal to one ton of refrigeration.
- (7) Existing Installations. The following rules apply to all refrigeration and air conditioning systems which were in use, or installed ready for use prior to the date upon which the rules adopted by the Board of Boiler Rules in accordance with the provisions of St. 1963 c. 561 as amended by St. 1971 c. 570 became effective. All existing installations shall be equipped with pressure relief devices as are required by 522 CMR 12.00 for new installations. Masks or helmets shall be provided as required by 522 CMR 9.90 for new installations. Any modifications made to existing systems shall be in accordance with the rules for new installations.
- (8) Field Inspections. Field inspections of refrigeration and air conditioning systems in Massachusetts shall be made only by District Engineering Inspectors in the employ of the Division of Inspection of the Department of Public Safety, or by a commissioned inspector holding a certificate of competency issued by the Department of Public Safety of the Commonwealth of Massachusetts.

9.03: Definitions

Approved means sanctioned or accepted by the Board of Boiler Rules.

An Approved Nationally Recognized Testing Laboratory is one acceptable to the Board of Boiler Rules, that provides uniform testing and examination procedures under established standards, is properly organized, equipped, and qualified for testing, and has a follow-up inspection service of the current production of the listed products.

Authorized Manufacturer. A manufacturer who has registered with the Board of Boiler Rules and has been authorized by the Board to build pressure vessels for use in the Commonwealth of Massachusetts.

Commissioned Inspector.

- (a) A District Engineering Inspector employed by the Division of Inspection, Department of Public Safety, Commonwealth of Massachusetts, or
- (b) An inspector holding a Certificate of Competency as a boiler inspector, issued him by the Division of Inspection to field inspect pressure vessels within the Commonwealth or to make shop inspections in the shop of authorized manufacturers while employed by the authorized insurance company named on the certificate, or
- (c) An inspector employed by an authorized insurance company who holds a current commission issued him by the National Board, or such other inspectors holding National Board Commissions as are approved by the Chief of Inspections.

Machinery Room as required by 522 CMR 9.90 is a room in which a refrigerating system is permanently installed and operated but not including evaporators located in a cold storage room, refrigerator box, air cooled space, or other enclosed space. Closets solely contained within, and opening only into a room shall not be considered machinery rooms but shall be considered a part of the machinery room in which they are contained or open into. It is not the intent of this definition to cause the space in which a self-contained system is located to be classified as a machinery room. (See 522 CMR 9.90.)

Machinery Room, Class T as required by 522 CMR 9.90 is a room having machinery but no flame producing apparatus permanently installed and operated and also conforming to the following:

- (a) Any doors, communicating with the building, shall be approved self-closing, tight-fitting fire doors.
- (b) Walls, floor and ceiling shall be tight and of not less than one-hour fire-resistive construction.
- (c) It shall have an exit door which opens directly to the outer air or through a vestibule-type exit equipped with self-closing, tight-fitting doors.
- (d) Exterior openings, if present, shall not be under any fire escape or any open stairway.
- (e) All pipes piercing the interior walls, ceiling or floor of such room shall be tightly sealed to the walls, ceiling, or floor through which they pass.
- (f) Emergency remote controls to stop the action of the refrigerant compressor shall be provided and located immediately outside the machinery room.
- (g) An independent mechanical means shall be provided for ventilation. (See 522 CMR 9.03(11)(c).)
- (h) Emergency remote controls for the mechanical means of ventilation shall be provided and located outside the machinery room.

Refrigerating System is a combination of interconnected refrigerant- containing parts constituting one closed refrigerant circuit in which a refrigerant is circulated for the purpose of extracting heat. (See 522 CMR 9.05 for classification of refrigerating systems by type.)

- (a) Absorption System is a refrigerating system in which the gas evolved in the evaporator is taken up by an absorber or adsorber.
- (b) Sealed Absorption System is a unit system (or Group 2 refrigerants only, in which all refrigerant-containing parts are made permanently tight by welding or brazing against refrigerant loss. (This is a restrictive definition for the purposes of 522 CMR 9.00, as used in 522 CMR 9.90.) (See 522 CMR 9.03(39)(a).)

9.03: continued

- (c) Self-Contained System is a complete factory-made and factory tested system in a suitable frame or enclosure which is fabricated and shipped in one or more sections and in which no refrigerant-containing parts are connected in the field other than by companion or block valves.
- (d) Unit System is a self-contained system which has been assembled and tested prior to its installation and which is installed without connecting any refrigerant-containing parts. A unit system may include factory-assembled companion or block valves.

9.90: Safety Code for Mechanical Refrigeration

(1) Scope and Purpose.

- (a) In accordance with the provisions of M.G.L. c. 146, § 2, the Board of Boiler Rules herewith adopts by reference The 1997 ANSI/ASHRAE Safety code.
- (b) The application of this Code is intended to assure the safe design, construction, installation, operation, and inspection of every refrigerating system employing a fluid which normally is vaporized and liquefied in its refrigerating cycle, when employed under the occupancy classifications listed in the ANSI/ASHRAE safety code.
- (c) The provisions of this Code are not intended to apply to the use of water or air as a refrigerant, nor to gas bulk storage tanks that are not permanently connected to a refrigerating system, nor to refrigerating systems installed on railroad cars, motor vehicles, motor drawn vehicles or on shipboard.

(2) General Notes.

EDITOR'S NOTE: ASME Codes when adopted in their entirety by the Board of Boiler Rules are not published by the State Secretary in the Code of Massachusetts Regulations.

REGULATORY AUTHORITY

522 CMR 9.00: M.G.L. c. 146, §§ 81 through 85; c. 22, § 10A.

522 CMR 10.00: MATERIAL SPECIFICATIONS

Section

10.01: Scope and Application

10.01: Scope and Application

(1) In accordance with the provisions of M.G.L., c. 146, § 2, the Board of Boiler Rules herewith adopts by reference MATERIAL SPECIFICATIONS, Parts A, B, C, and D 1998 edition, with 1999 addenda, formulated and published by the American Society of Mechanical Engineers, as ASME BOILER AND PRESSURE VESSEL CODE, SECTION II.

(2) These Material Specifications shall be applicable to the manufacture and construction of all steam boilers, nuclear vessels and piping, and unfired pressure vessels subject to the provisions of M.G.L. c. 146.

(3) The amendments herein, including deletions and/or additional requirements, shall take effect six months after publication by the Secretary of the Commonwealth, provided, the Board may upon request, permit application of the amended rules, to installations made during said six months.

REGULATORY AUTHORITY

522 CMR 10.00: M.G.L. c. 146; c. 22, § 10A.

NON-TEXT PAGE



522 CMR 11.00: WELDING SPECIFICATIONS

Section

11.01: Scope and Application

11.01: Scope and Application

(1) In accordance with the provisions of M.G.L. c. 146, §§ 2 and 35, the Board of Boiler Rules herewith adopts by reference QUALIFICATION STANDARD FOR WELDING AND BRAZING PROCEDURES, WELDERS, BRAZERS, AND WELDING AND BRAZING OPERATORS, 1998, with 1999 addenda, formulated and published by the American Society of Mechanical Engineers as ASME BOILER AND PRESSURE VESSEL CODE, SECTION IX.

(2) These Standards shall be applicable to all steam boilers, nuclear vessels and piping, and unfired pressure vessels subject to the provisions of M.G.L. c. 146.

(3) The amendments herein, including deletions and/or additional requirements, shall take effect six months after publication by the Secretary of the Commonwealth, provided, the Board may upon request, permit application of the amend

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522 CMR 12.00: FIBERGLASS-REINFORCED PLASTIC PRESSURE VESSELS

Section

12.01: Scope and Application

12.01: Scope and Application

(1) In accordance with the provisions of M.G.L. c. 146, § 2, the Board of Boiler Rules herewith adopts by reference Fiberglass Reinforced Plastic Pressure Vessels, 1998 Edition, with 1999 addenda, formulated and published by the American Society of Mechanical Engineers, as ASME BOILER AND PRESSURE VESSEL CODE, SECTION X.

(2) 522 CMR 12.00 shall be applicable to the Construction, Fabrication, Qualifying Designs and Procedures, Testing, Inspection, Marking, Stamping and Reports of Fiberglass-Reinforced Plastic Pressure Vessels as used for the storage of compressed air and gases used for refrigeration, subject to the provisions of M.G.L. c. 146.

REGULATORY AUTHORITY

522 CMR 12.00: M.G.L. c. 146; c.10A, § 6; c. 22, § 10A.

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522 CMR 13.00: INSERVICE INSPECTION OF NUCLEAR POWER PLANT COMPONENTS  
--DIVISION I

Section

13.01: Scope and Application

13.01: Scope and Application

In accordance with the provisions of M.G.L. c. 146 as amended by St. 1975 c. 699, St. 1978 c. 34; M.G.L. c. 30, § 37; M.G.L. c. 30A, § 5; and M.G.L. c. 22, § 10A; the Board of Boiler Rules adopts RULES FOR INSERVICE INSPECTION OF NUCLEAR POWER PLANT COMPONENTS (BLR 12) as formulated and published by the American Society of Mechanical Engineers, Section XI, Division 1, 1998 edition, with 1999 addenda. It is not reprinted here but is available from ASME, Order Department, 345 East 47th Street, New York, N.Y. 10017.

REGULATORY AUTHORITY

522 CMR 13.00: M.G.L. c. 146.

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